State of California

Memorandum

To: John S. Sanders, Chief
Environmental Monitoring and
Pest Management Branch

Date: February 6, 1997

From: **Department of Pesticide Regulation** - 1020 N Street, Room 161
Sacramento, California 95814-5624

Subject: METHYL BROMIDE MONITORING: CHAMBER FUMIGATION, WINTERS, CALIFORNIA

Summary
This study measured the air concentrations associated with a methyl bromide fumigation of commodity chambers to evaluate the effectiveness of established buffer zones.

Two fumigation chambers located less than 100 ft from each other were treated with methyl bromide as part of ongoing commodity treatment for storage and shipment. The 11,970 ft^3 and 11,000 ft^3 volume chambers were fumigated with 32 and 22 lbs of methyl bromide, respectively. The treatment period lasted 12 hours, after which the tarp doors were partially opened and exhaust fans were turned on. Ten sampling stations were located around the two chambers at the respective buffer zone limit for each treatment. Additional samplers were placed at nearby residences. The highest 12-hour average concentration measured during treatment was 0.228 ppm at the site located on the 40 ft buffer zone limit downwind from one of the fumigation chambers. The highest four hour average concentration measured during aeration was 0.077 ppm at the same site. None of the measured concentrations exceeded the 0.21 ppm 24-hour Time Weighted Average (TWA) target level.

The buffer zone limits were protective of the 24-hour health limit.

Introduction

Methyl bromide is a widely used pesticide for fumigation of stored product pests. In 1995, the Department of Pesticide Regulation (DPR) issued suggested permit conditions for methyl bromide used for commodity fumigations. DPR has reviewed the health-related studies on methyl bromide and determined that a 24-hour time-weighted average concentration of 0.21 ppm provides a 100-fold margin of safety to protect the public health. This 0.21 ppm target level has been used to develop permit conditions for field, commodity, and other types of fumigation.

The permit conditions include buffer zones that must be maintained between the application site and those places where people are active. The buffer zone is not an exclusion zone; people can walk or drive through a buffer zone and still not be at risk because they are spending only a short time near the application site. The size of the buffer zone varies based on the amount of time a person would normally spend doing a certain activity. The 0.21 ppm target level for methyl bromide is based on a 24-hour continuous exposure. For example, a person could be exposed to 0.42 ppm for 12 hours or 0.63 ppm for eight hours without exceeding the 0.21 ppm, 24-hour time-weighted average. Accordingly, buffer zones must be larger if the activity can be conducted for 24 hours, such as spending time at home or in an institution. The buffer zone can be reduced when the activity is conducted for less than 12 hours, such as a normal 8-hour work shift or a round of golf.

The objective of this study was to monitor methyl bromide concentrations associated with a chamber fumigation to determine effectiveness of the established buffer zone distances.

Materials and Methods

The fumigation chambers were located at two adjacent nut production companies in Winters, California. Each company has a chamber consisting of two smaller chambers for fumigation of product prior to storage or export. The

site is located near residential areas, approximately 90 ft from the nearest residence. Buffer zones for the 11,000 ft^3 and 11,970 ft^3 volume chambers were calculated to be 40 ft and 50 ft, respectively.

Heavy tarp flaps secured the opening of each cement chamber. Methyl bromide was introduced into the chamber at 6:00 p.m. and fumigation was continued for 12 hours. A total of 22 lbs and 32 lbs of methyl bromide were used to treat the 11,000 ft^3 and 11,970 ft^3 chamber, respectively. At the end of the treatment period, the bottom of the tarp door was opened and exhaust fans were turned on. Both chambers had standard height exhaust stacks which were 10 ft above any major obstruction within 200 ft of the stack. Aeration was continued for four hours; then the tarp doors were rolled up and produce was removed.

Samplers were placed around the fumigation chambers at the buffer zone distances of 40 ft and 50 ft for each respective chamber and in the yard or fence line of the nearest residence during the fumigation and aeration. A weather station was set up next to the treatment area to measure wind speed, wind direction, ambient temperature, and relative humidity.

Air monitoring was conducted using SKC personal air sampling pumps. Each air sampler was positioned approximately 1.2 m (4 ft) above ground level and was fitted with activated charcoal vapor collection tubes stacked, two in a series, each consisting of a 400 mg primary tube and a 200 mg secondary tube. During the treatment holding period, the flow rate was set to approximately 15 ml/min for the 12-hour period. The total collection volume should not exceed 11 liters to avoid breakthrough into the secondary tube. During the aeration period, flow rates were set at approximately 45 ml/min. After samples were collected, each tube opening was tightly capped, placed on dry ice, and kept frozen until analysis.

Results
Chemical analysis was performed by the California Department of Food and Agriculture Center for Analytical Chemistry. Methyl bromide was extracted with ethyl acetate and then analyzed by gas chromatography with an electron

capture detector. The reporting limit for methyl bromide on charcoal media was 0.2 ug/tube. The percent recovery from quality assurance spikes analyzed with sample sets ranged from 74.7 to 85.0 % recovery. There was no breakthrough of methyl bromide from the primary tube to the secondary tube.

Results are located in Table 1. During the treatment and aeration periods, none of the measured average concentrations exceeded the 0.21 ppm 24-hour TWA target level. Samplers placed at the closest residence did not detect any measurable amount of methyl bromide during treatment or aeration. The highest 12-hour average concentration measured during treatment was 0.228 ppm at site 5, located at the 40 ft buffer zone limit, downwind from one of the fumigation chambers. The highest four-hour average concentration measured during aeration was 0.077 ppm at the same site. A 24-hour TWA is calculated by multiplying the average concentration per sampling period by the duration of the sampling period for the fumigation and release periods, and adding them with an assumed concentration of 0 ppm for the remaining eight hours and dividing by 24 hours.

Example:
$$\text{Period 4} = \frac{(0.028 \text{ ppm} \times 12 \text{ hours}) + (0.016 \text{ ppm} \times 4 \text{ hours}) + (0.0 \text{ ppm} \times 8 \text{ hours})}{24}$$

None of the sites exceeded the 24-hour exposure limit. During the entire fumigation, the weather pattern included cloudy skies and some light rain. The wind speed averaged 3.9 mph with gusts to 10.4 mph. The storm conditions altered the wind direction from the usual southern direction to a southwestern pattern, away from the residences and street.

Conclusion
For this fumigation event, the buffer zones provided an adequate protection for a 24-hour exposure.

If you have any questions, please contact Pam Wofford, at (916) 324-4297, or
Randy Segawa at (916) 324-4137.

Pam Wofford, Associate
Environmental Research Scientist
Environmental Monitoring and
  Pest Management Branch

Randy Segawa, Supervisor
Senior Environmental Research Scientist
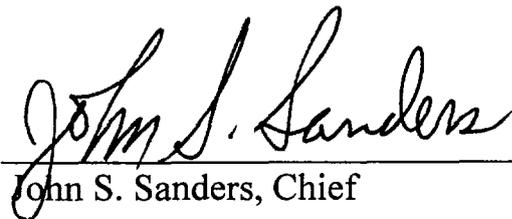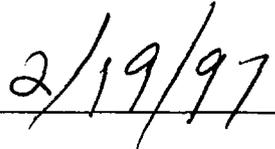Environmental Monitoring and
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Approved: _____ Date: 2/19/97
  John S. Sanders, Chief

Table 1. Measured average concentrations of methyl bromide expressed as ppm per hour.

Location	Fumigation Period (12-hours) ppm	Release Period (4-hours) ppm	24-hour TWA ppm
1	ND	ND	ND
2	ND	ND	ND
3	0.006*[1]	ND	0.003
4	0.028	0.016	0.017
5	0.228	0.077	0.127
6	0.021	0.018	0.013
7	0.077*[2]	0.047	0.046
8	0.014	0.018	0.010
9	0.009	0.010	0.006
10	0.009	0.007	0.006

TWA = Time Weighted Average

ND = No detectable amount, detection limit approximately 0.005 ppm

*[1] Sampler shut down early; duration = 9.3 hours

*[2] Sampler shut down early; duration = 3.8 hours

Figure 1. Map of sampling locations with measured 24-hour Time Weighted Averages.